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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,324	07/11/2003	Tsung-Hua Wu	9245-US-PA	1323
31561	7590	08/11/2004	EXAMINER	
JIANQ CHYUN INTELLECTUAL PROPERTY OFFICE 7 FLOOR-1, NO. 100 ROOSEVELT ROAD, SECTION 2 TAIPEI, 100 TAIWAN			CAO, PHAT X	
			ART UNIT	PAPER NUMBER
			2814	

DATE MAILED: 08/11/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>		<b>Applicant(s)</b>	
	10/604,324		WU ET AL.	
	<b>Examiner</b>		<b>Art Unit</b>	
	Phat X. Cao		2814	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-21 is/are allowed.
- 6) ☒ Claim(s) 22-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. ____.  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____.   | 6) <input type="checkbox"/> Other: ____.                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. Claim 28 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 28, the limitation "the solder blocks is selected from a group consisting of **lead...**" is unclear. It is unclear because claim 28 depends on claim 27. Claim 27 requires that "the solder blocks includes **lead-free** alloy". However, "the solder blocks is selected from a group consisting of **lead...**<sup>WHICH</sup>" is not considered as "**lead-free**".

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

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3. Claims 22 and 29-30 are rejected under 35 U.S.C. 102(e) as being anticipated by Eichelberger et al (US. 6,426,545).

Regarding claim 22, Eichelberger (Fig. 3E) discloses a method of forming bumps 350 over contact pads 330; depositing a flux material in an opening over the contact pads (column 11, lines 1-3); positioning a solder block 350 on the flux material (also see column 11, lines 1-3); conducting a reflow process so that the solder blocks 350 are bonded to the respective contact pads (column 11, lines 3-5); and removing the flux material (column 11, lines 5-6).

Regarding claims 29-30, Eichelberger's Fig. 3E further discloses the solder block 350 is ball shaped and the contact pad material is copper (column 12, lines 66-67).

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 22 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Grigg et al (US. 2002/0068453).

Grigg (Fig. 5) discloses a method of forming bumps or solder balls over contact pads located on upper surface of substrate 50 (not shown, see par. [0069]), comprising the steps of: depositing a flux material over the contact pads (par. [0067]); positioning a solder balls on the flux material (par. [0067]); conducting a reflow process so that the solder balls are bonded to the respective contact pads (pars. [0068]-[0069]); and removing the flux material (par. [0027]).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 23-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eichelberger et al or Grigg et al in view of Tago et al (US. 2002/0093096).

Regarding claims 23-25 and 27-28, neither Eichelberger nor Grigg disclose the forming of adhesion layer and a metallic layer over the contact pad as claimed.

However, Tago (Fig. 1) teaches the forming of an adhesion layer 4 made of titanium (par. [0101]) over the aluminum contact pad 2, the forming of a metallic layer 5 made of nickel/vanadium (par. [0101]) over the adhesion layer 4, and the forming of solder balls 9 or 7 containing no lead (lead-free) and made of silver (par. [0071]).

Accordingly, it would have been obvious to modify the process of Eichelberger and Grigg by forming the adhesion layer/metallic layer with the structures as set forth above over the contact pad before the step of depositing flux because as taught by Tago, such layers would provide the barrier layers (par. [0012]) for a highly reliable semiconductor chip electrode structure that can control interface reaction of bonding sections (par. [0013]).

Regarding claim 26, Tago further teaches the known feature of forming the solder balls including lead-tin alloy (par. [0005]).

***Allowable Subject Matter***

8. Claims 1-21 are allowed.

The prior art of record fails to disclose the combination of the method steps recited in the base claims, including the steps of removing the flux material and the photoresist layer.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PC  
August 5, 2004

  
PHAT X. CAO  
PRIMARY EXAMINER